

Fundamentals of Mathematics

Q $|x-4|+|x-3|=7$

Q $|x-1|+|x-3|=4$

Q $|2x-1|+|x|=3$



$x = \frac{4}{3}, -\frac{2}{3}$

A) $x > \frac{1}{2}$ $x=1$ $|2x-1|+|1|$
 $\oplus \oplus$
 $2x-1+x-3$ $3x-4 \Rightarrow x = \frac{4}{3}$ ✓

B) $0 \leq x \leq \frac{1}{2}$ $x = \frac{1}{4}$ $|2x-\frac{1}{2}|+|\frac{1}{4}|$
 $\ominus \oplus$
 $-(2x-1)+x-3$
 $-x = 2 \Rightarrow x = -2 \notin [0, \frac{1}{2}]$
 $\otimes$

C) $x < 0$ $x = -1$ $|2x-1|+|-1|$
 $\ominus \ominus$
 $-(2x-1)-x-3$
 $-3x = 2$
 $x = -\frac{2}{3}$ ✓

Fundamentals of Mathematics

Modulus Eqⁿ.

APProach 1

$$\text{Q } |x-1| = 4 \text{ find } x.$$

$$x-1 = 4, -4$$

$$\underline{x = 5, -3}$$

$$\text{Q } ||x-2|-3| = 4.$$

$$|x-2|-3 = 4, -4$$

$$|x-2| = 4+3, -4+3$$

$$|x-2| = 7, \text{ (X)}$$

$$|x-2| = 7 \Rightarrow x-2 = 7, -7 \quad \boxed{x = 9, -5}$$

APP2 $|x|^2 = x^2$

$$\text{Q } x^2 + 7|x| + 10 = 0 \text{ find } x?$$

$$|x|^2 + 7|x| + 10 = 0$$

$$t^2 + 7t + 10 = 0$$

$$(t+2)(t+5) = 0$$

$$\underline{t = -2} \text{ or } \underline{t = -5}$$

$$|x| = -2 \text{ or } |x| = -5$$

(+) +ve (+) -ve

(X) (X)

$$x = \phi$$

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APP-3

$$|f(x)| = f(x) \Rightarrow f(x) \geq 0$$

$$|f(x)| = -f(x) \Rightarrow f(x) \leq 0$$

Q $|x+2| = -(x+2)$ find x

$$x+2 \leq 0$$

$$x \leq -2$$

$$x \in (-\infty, -2]$$



$$|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

Q $|x+4| = (x+4)$

As it is

$$\Rightarrow x+4 \geq 0$$

$$x \geq -4$$

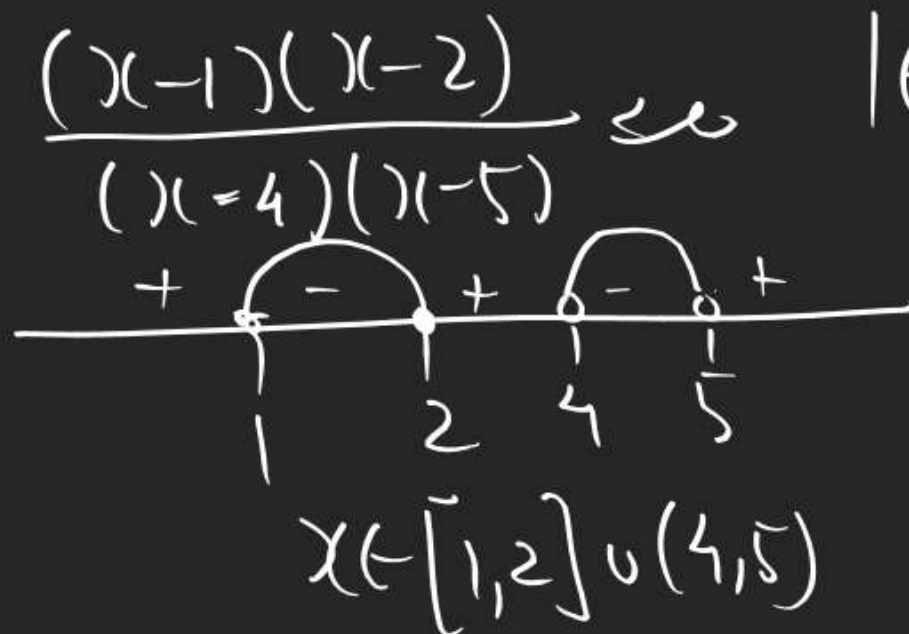
$$x \in [-4, \infty)$$

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Q Ex $\left| \frac{x^2 - 3x + 2}{x^2 - 9x + 20} \right| = - \left(\frac{x^2 - 3x + 2}{x^2 - 9x + 20} \right) \text{ find } x$

- Minus K Sath.

$$\frac{x^2 - 3x + 2}{x^2 - 9x + 20} \leq 0$$



$$|3| + |5| = |3+5|$$

$$(\underline{3}) + (\underline{5}) = |8| = 8$$

$$|(-3)| + |(-5)| = |-3-5|$$

$$3 + 5 = |-8| = 8 \checkmark$$

$$|3| + |-5| = |3+(-5)|$$

$$3 + 5 = |-2| = 2$$

APP4 Ex $|a+b| = |a|+|b|$ then $\boxed{a \cdot b \geq 0}$

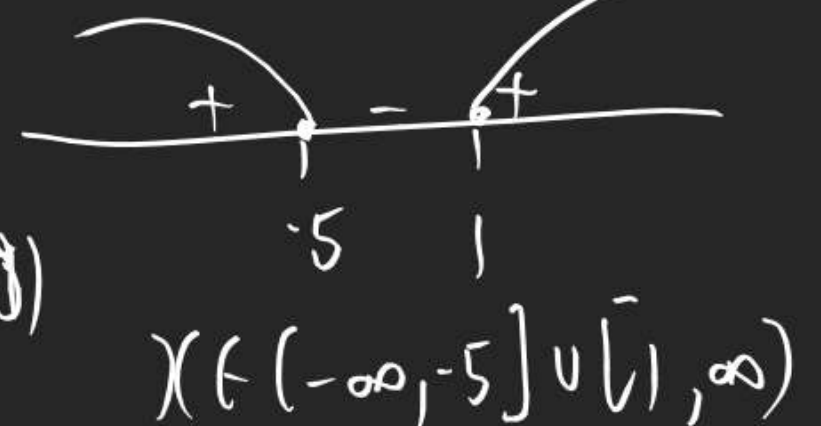
Q $|x-1| + |x+5| = |2x+4|$

$$|a| + |b| = |(x-1) + (x+5)|$$

$|a+b|$

$$\Rightarrow a \cdot b \geq 0$$

$$(x-1)(x+5) \geq 0$$



Fundamentals of Mathematics

Trigo Phase 1

Angle Measurement

A) Sexagesimal System [Degree]

In this system we divide a Rt. angle in 90 equal parts. & each part is known as 1° .

(B) Centesimal System [Gradu]

In this system we have divided a Rt. angle into 100 equal parts. each part is known as "grade".

(C) Circular System [Radian]

1 Radian is defined by an angle subtended at centre of a circle by an arc equal to its Radius.

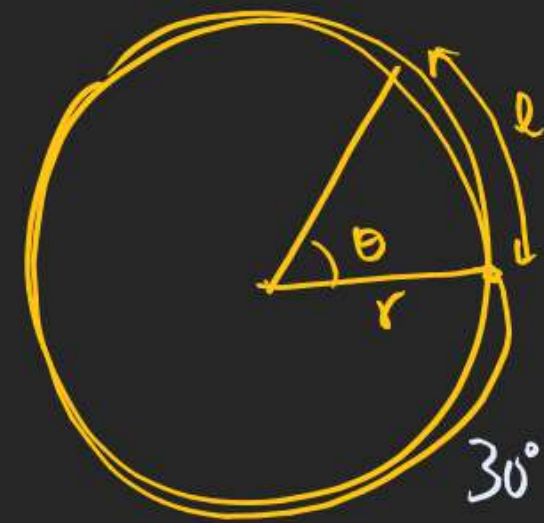
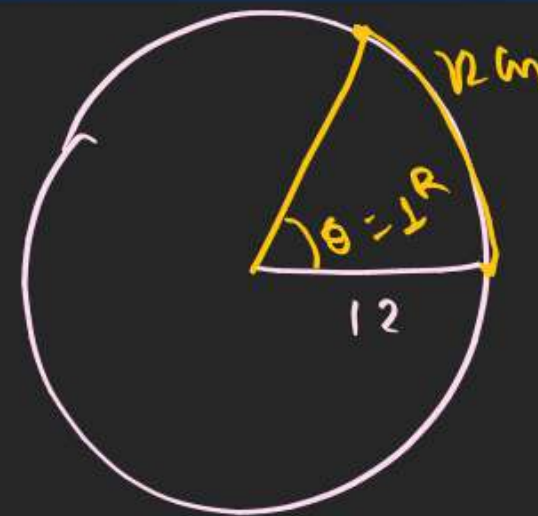
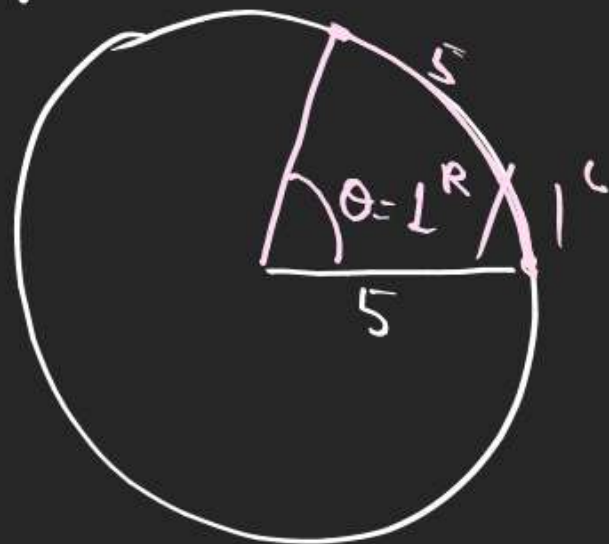
$$\text{Angle} = \frac{\text{Arc}}{\text{Radius}}$$

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When Arc = Radius

$$\Rightarrow \theta = \text{angle} = \frac{\text{Arc}}{\text{Rad}} = 1^R$$

$\Rightarrow$ If circle is of rad = 5
then angle projected by
Arc of 5 is 1 Rad.



$$\theta = \frac{l}{r} \Rightarrow$$

$$l = r\theta$$

$$1^\circ = \frac{\pi^c}{180}$$

$$36^\circ = \frac{\pi}{6}$$

$$30^\circ = \frac{\pi^c}{180} \times 30$$

When 1 complete Rotation is done

$$l = 2\pi r$$

$$\theta = \frac{l}{r} = \frac{2\pi r}{r} = 2\pi^R = 360^\circ$$

$$\pi^c = 180^\circ \Rightarrow$$

$$1^c \approx 57^\circ$$

$$1^c = \frac{180^\circ}{\pi} = \frac{180^\circ}{3.14} \approx 57^\circ$$

$$\begin{aligned} 1^c &\approx 57^\circ \\ \pi^c &\approx 180^\circ \\ 2\pi^c &= 360^\circ \end{aligned}$$

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Q Convert from deg to Rad?

$$45^\circ \rightarrow 45 \times \frac{\pi}{180} = \frac{\pi}{4}$$

$$30^\circ \rightarrow 30 \times \frac{\pi}{180} = \frac{\pi}{6}$$

$$60^\circ \rightarrow 60 \times \frac{\pi}{180} = \frac{\pi}{3}$$

$$90^\circ \rightarrow 90 \times \frac{\pi}{180} = \frac{\pi}{2}$$

$$120^\circ \rightarrow 120 \times \frac{\pi}{180} = \frac{2\pi}{3}$$

$$150^\circ \rightarrow 150 \times \frac{\pi}{180} = \frac{5\pi}{6}$$

$$180^\circ \rightarrow \pi$$

$$135^\circ \rightarrow 135 \times \frac{\pi}{180} = \frac{3\pi}{4}$$

$$215^\circ \rightarrow 215 \times \frac{\pi}{180} = \frac{43\pi}{36}$$

$$300^\circ \rightarrow 300 \times \frac{\pi}{180} = \frac{5\pi}{3}$$

$$330^\circ \rightarrow 330 \times \frac{\pi}{180} = \frac{11\pi}{6}$$

$$360^\circ \rightarrow$$

$$2\pi$$

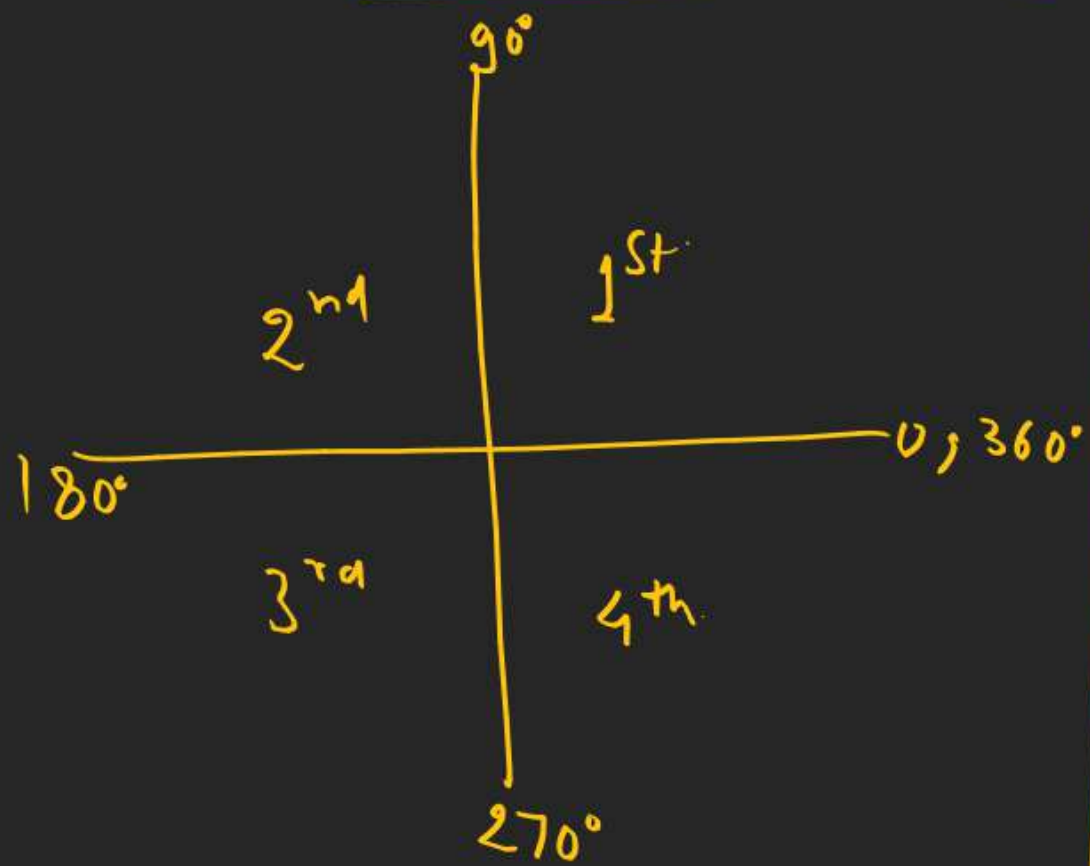
Degree to Radian = Multiply by $\frac{\pi}{180^\circ}$

Radian to Degree = Multiply by $\frac{180^\circ}{\pi}$

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Trigo Ph 1

Some Important Deg & Rad.



1st Quad

$$30^\circ \rightarrow \frac{\pi}{6}$$

$$45^\circ \rightarrow \frac{\pi}{4}$$

$$60^\circ \rightarrow \frac{\pi}{3}$$

$$75^\circ \rightarrow \frac{5\pi}{12}$$

$$90^\circ \rightarrow \frac{\pi}{2}$$

2nd Quad

$$120^\circ \rightarrow \frac{2\pi}{3}$$

$$135^\circ \rightarrow \frac{3\pi}{4}$$

$$150^\circ \rightarrow \frac{5\pi}{6}$$

$$180^\circ \rightarrow \pi$$

3rd Quad

$$210^\circ \rightarrow \frac{7\pi}{6}$$

$$225^\circ \rightarrow \frac{5\pi}{4}$$

$$240^\circ \rightarrow \frac{4\pi}{3}$$

$$270^\circ \rightarrow \frac{3\pi}{2}$$

4th Quad

$$300^\circ \rightarrow \frac{5\pi}{3}$$

$$315^\circ \rightarrow \frac{7\pi}{4}$$

$$330^\circ \rightarrow \frac{11\pi}{6}$$

$$360^\circ \rightarrow 2\pi$$

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13 Lec

10th class

Imp Identities.

A) $\sin^2 \theta + \cos^2 \theta = 1$

B) $\sec^2 \theta - \tan^2 \theta = 1 \rightarrow (\sec \theta - \tan \theta)(\sec \theta + \tan \theta) = 1$

C) $\sec^2 \theta - \tan^2 \theta = 1$

$$\sec \theta - \tan \theta = \frac{1}{\sec \theta + \tan \theta}$$

$$\sec \theta - \tan \theta = \frac{1}{\sec \theta + \tan \theta}$$

(D) $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \cdot \cos^2 \theta \rightarrow \text{P.T. Q.S.}$
Ans.

(E) $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \cdot \sin^2 \theta$

$$\begin{aligned} & \tan^2 \theta - \sin^2 \theta \\ &= \frac{\sin^2 \theta}{\cos^2 \theta} - \sin^2 \theta \\ &= \sin^2 \theta \left(\frac{1}{\cos^2 \theta} - 1 \right) \\ &= \sin^2 \theta \times \left(\frac{1 - \cos^2 \theta}{\cos^2 \theta} \right) \\ &= \sin^2 \theta \times \frac{\sin^2 \theta}{\cos^2 \theta} \\ &= \sin^2 \theta \times \tan^2 \theta \text{ R.H.S.} \end{aligned}$$

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F)
New

$$\sin^4 \theta + \cos^4 \theta = 1 - 2 \sin^2 \theta \cos^2 \theta$$

$$\text{LHS } (a^2 + b^2 + 2ab)$$

$$\{(\sin^2 \theta)^2 + (\cos^2 \theta)^2 + 2 \sin^2 \theta \cos^2 \theta\} - 2 \sin^2 \theta \cos^2 \theta$$

$$\{ \sin^2 \theta + \cos^2 \theta \}^2 - 2 \sin^2 \theta \cos^2 \theta$$

$$1 - 2 \sin^2 \theta \cos^2 \theta \text{ RHS}$$

G)
New

$$\sin^6 \theta + \cos^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$$

$$\text{LHS } (\sin^2 \theta)^3 + (\cos^2 \theta)^3$$

$$= (\sin^2 \theta + \cos^2 \theta)^3 - 3 \sin^2 \theta \cos^2 \theta (\sin^2 \theta + \cos^2 \theta)$$

$$= 1 - 3 \sin^2 \theta \cos^2 \theta$$

RHS

$$a^3 + b^3 + 3ab(a+b) = (a+b)^3$$

$$a^3 + b^3 = (a+b)^3 - 3ab(a+b)$$

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Q. $\sec^4 x - 6\sec^2 x + 2\sec^2 x + 26\sec^2 x = \frac{15}{4}$

find $\tan x = ?$

$$(\sec^4 x - 2\sec^2 x + 1) - (\sec^4 x - 2\sec^2 x + 1) = \frac{15}{4}$$

$$(\sec^2 x - 1)^2 - (\sec^2 x - 1)^2 = \frac{15}{4}$$

$$(\tan^2 x)^2 - 1(\sec^2 x)^2 = \frac{15}{4}$$

$$\tan^4 x - \frac{1}{\tan^4 x} = 4 - \frac{1}{4}$$

$$\sec^2 x - \tan^2 x = 1$$

$$\sec^2 x - 1 = \tan^2 x$$

$$(\sec^2 x - 1) = \tan^2 x$$

$$\sec^2 x - 1 = \tan^2 x$$

$$\tan^2 x = \frac{1}{\tan^2 x}$$

$$\tan^4 x = 4$$

$$\tan^2 x = \pm 2 \Rightarrow \tan^2 x = 2 \quad \text{or} \quad -2$$

$$\tan^2 x = 2$$

$$\tan x = \pm \sqrt{2}$$

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Q If $\sin x + \sin^2 x = 1$ then $\boxed{\cos^8 x} + 2 \cos^6 x + \boxed{\cos^4 x} = ?$

$$\sin x = 1 - \sin^2 x$$

$$\sin x = \boxed{\cos^2 x}$$

$$\sin^2 x = \cos^4 x$$

$$\sin^4 x = \cos^8 x$$

$$\sin^4 x + 2 \cos^2 x \cdot \boxed{\cos^4 x} + \sin^2 x$$

$$\sin^4 x + 2 \boxed{\cos^2 x} \sin^2 x + \sin^2 x$$

$$\sin^4 x + 2 \sin x \cdot \sin^2 x + \sin^2 x$$

$$\boxed{\sin^4 x} + 2 \sin^3 x + \boxed{\sin^2 x}$$

$$(\sin^2 x)^2 + 2 \sin^2 x \cdot \sin x + (\sin x)^2$$

$$\boxed{(\sin^2 x + \sin x)^2} = 1^2 = 1$$

→ Kisi Ka Perfect Sq^r h?

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Q If $\sec x - \tan x = p$ then $\sec x = ?$

$$\begin{aligned}\sec x - \tan x &= p \\ \sec x + \tan x &= \frac{1}{p} \\ \text{add} \quad & \hline 2\sec x &= p + \frac{1}{p} \\ \sec x &= \frac{1}{2} \left(p + \frac{1}{p} \right)\end{aligned}$$

$$\frac{\sec x - \tan x}{\sec x + \tan x} = \frac{1}{p}$$

$$p = \frac{1}{\sec x + \tan x}$$

$$\sec x + \tan x = \frac{1}{p}$$

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Q P.T.

$$1) \sqrt{\sec^2 \theta + \tan^2 \theta} = \tan \theta + \sec \theta$$

$$2) (\sec \theta - \tan \theta)(\sec \theta + \tan \theta)(\tan \theta + \sec \theta) = 1$$

$$3) \tan \theta + \sec \theta = 3 \text{ then } \tan \theta =$$

$$4) \text{ If } 2 \tan \theta = 2 - \sec \theta \text{ then } \tan \theta = ?$$

$$5) 3 \sec^4 \theta + 8 = 10 \sec^2 \theta \text{ then } \tan \theta = ?$$

$$(6) \frac{\sin x + \cos x}{\cos^3 x} = \tan^3 x + \tan^2 x + \tan x + 1$$

$$\log K \text{ DPP} \rightarrow 3$$